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AIR QUALITY SURVEY MERCURY CONCENTRATIONS ON AND AROUND THE FORMER DOMINION BRIDGE SITE SAULT STE. MARIE AUGUST, 1986

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Air Quality Survey
Mercury Concentrations
on and around the former
Dominion Bridge Site
Sault Ste. Marie
August, 1986

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by

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1.0 SUMMARY:

In August 1986 a mobile air monitoring unit from the Air Resources Branch measured the elemental mercury concentrations in air in the vicinity of the former Dominion Bridge site (Welded Beam Division property of Algoma Steel) in Sault Ste. Marie.

A previous study by Northeastern Region Staff on the property had indicated some soil contamination by mercury and other metals. Also, traces of mercury above background levels but below existing guidelines were found in water and sediment samples taken from a perimeter ditch which drains into Fort Creek located adjacent to the property.

Mercury concentrations on the property at ground-level were in the range of 10 to 500 nanograms per cubic metre (ng/m^3) well below the Ontario standard of 5,000 ng/m^3 for a ½-hour average. At a height of two meters the largest concentration was 50 ng/m^3.

Measurements taken downwind and upwind were all in the 20 to 70 ng/m^3 range and indicated that the site was not a significant source of mercury in the ambient air.

1.0 Sommaire

En août 1986, une unité mobile de surveillance de l'air, appartenant à la Direction des ressources atmosphériques, a mesuré la concentration de mercure élémentaire dans l'air aux environs de l'emplacement de l'ancien pont Dominion (propriété de la Division des profilés soudés d'Algoma Steel) à Sault Ste. Marie.

Une étude de cet emplacement déjà effectuée par le personnel de la région du Nord-Est avait permis de relever une certaine contamination du sol par le mercure et par d'autres métaux. De plus, on a trouvé des traces de mercure, supérieures aux concentrations de fond mais inférieures aux normes en vigueur, dans des échantillons d'eau et de sédiments extraits d'un fossé qui, longeant la propriété, se déverse dans le ruisseau Fort Creek, contigu à l'emplacement étudié.

À cet emplacement, les concentrations de mercure au niveau du sol se situaient entre 10 et 500 nanogrammes par mètre cube (ng/m^3), ce qui est bien inférieur à la norme ontarienne de 5 000 ng/m^3 en moyenne, calculée sur une demi-heure. À une hauteur de deux mètres, la concentration maximale était de 50 ng/m^3.

Des mesures prises sous le vent et contre le vent ont permis de relever des concentrations se situant entre 20 et 70 ng/m^3. L'emplacement ne constitue donc pas une source importante de mercure dans l'air ambiant.

2.0 INTRODUCTION:

In August 1986 a mobile air monitoring unit (MAMU #2) from the Air Resources Branch measured the elemental mercury (Hg) concentrations in air in the vicinity of the former Dominion Bridge site (Welded Beam Division property of Algoma Steel) in Sault Ste. Marie.

The purpose of the study was to determine whether an air quality problem existed as a result of the site's former use (by Dominion Bridge) in a welding operation using mercury in the process and the disposal of undetermined quantities of mercury on the site property.

A previous study by Technical Support staff of the Northeastern Region determined the levels of mercury and other metals in soil, sediments and water on the site and adjoining areas.

3.0 SURVEY TECHNIQUE:

The mercury analyzer is a Scintrex Model HGP-2 ultra-violet (UV) spectrophotometer which uses the attenuation (absorption) of UV light by mercury as a measure of the amount of elemental mercury in the air sample. Organic mercury compounds are not detected. The air sample is pulled from the roof level (approx. 3 m high) outside MAMU #2 through a stainless steel pipe and teflon hose to the analyzer at a volume flow rate of 280 litres per minute. The detection limit of the system is less that 10 ng/m^3 (10×10^{-9} g/m^3), which is only a small fraction (1/500) of the Ontario standard - 5 $micrograms/m^3$ (5×10^{-6} g/m^3) for a ½-hour.

On the first day of the survey, August 19, measurements were taken downwind of the two areas that had shown higher levels of Hg in the soil and sediment samples.

Background levels of Hg were also determined while permission was sought from Algoma Steel to drive the MAMU onto the site the next day and encounter the potential worst-case condition - close range, ground level and warm temperatures.

Permission was granted for site access the following day.

The MAMU was driven onto the site and parked near an area of suspected high Hg levels in soil. The MAMU sampling probe inlet, normally 3 to 5 meters above the ground, was connected to an 15 metre flexible hose and an inverted ventilated funnel. When placed on the ground this system sampled the air continuously at one foot height from the sheltered head space above the soil. After one or two minutes the funnel was moved a few feet away and new measurements taken. An average measurement (ng/m^3) representing an area approximately 10 feet by 10 feet and a duration of about six minutes was marked at the appropriate spot on a site map (Figure 1). A large, positive, instrumental drift (approx. 100 ng/hr) prevented ½-hour average measurements from being recorded since the instrument had to be re-zeroed every few minutes.

On several occasions the funnel was held two metres above the ground (numbers appended with A) to determine approximately what levels may be inhaled by company staff working in the yard.

A period of several hours was required to complete the survey over a rectangular area with dimensions roughly 700 feet by 200 feet.

The study was completed by off-site measurements downwind and upwind of the source, and a background measurement at the Water Tower Inn.

4.0 RESULTS AND DISCUSSION:

The results are summarized in Figure 1 and Table 1. All measurements on August 19 were made outside of the Algoma Steel property, either downwind or upwind or background. There was no pattern to the results since all readings were in the range of 20 to 70 ng/m^3 - well below the Ontario standard of 5,000 ng/m^3 (½-hour average) and downwind results were not significantly different from the upwind or background results.

The August 20 results are more interesting because of the definite mercury presence in the soil on the plant property. The largest concentrations at the ground level were approximately 500 ng/m^3 and the smallest concentrations were around 10 ng/m^3. The largest amounts were found in the area north of the northwest corner of the main building on the site. A spatial distribution pattern for the results on the Algoma Steel property shows good agreement with the mercury isopleths contained in the soils study by the Northeastern Region.

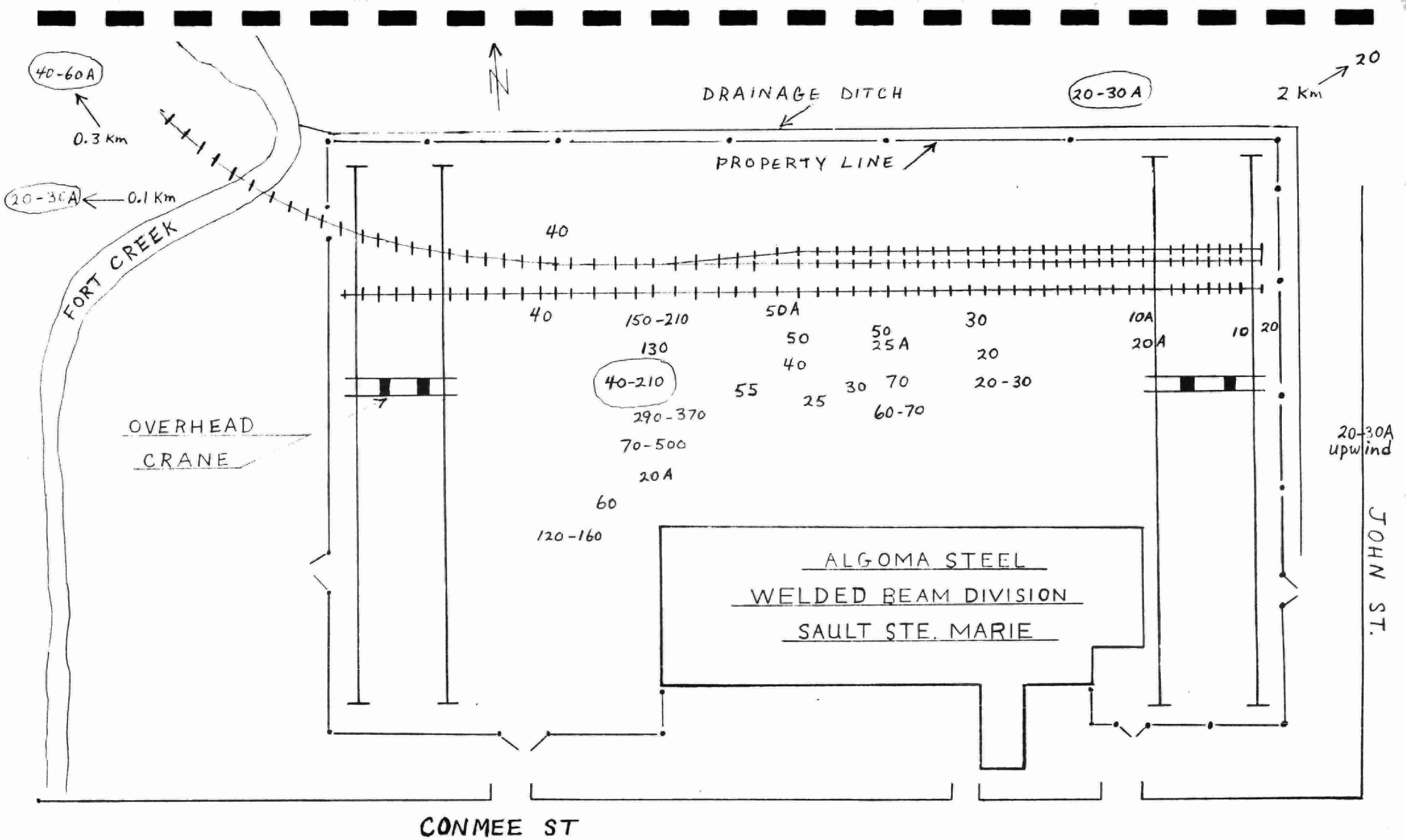
The Hg concentrations on the site at 2-3 meters height were always in the range of 10 to 50 ng/m^3.

The off-site concentrations on August 20 were always in the range of 20 to 30 ng/m^3, whether downwind or upwind or background measurements were being taken.

Table 1

August 19, 1986 Location	Hg Conc (ng/m^3)	Comments
Short St. at Bainbridge St; 0.3 km NNW of source	40-60 (A) downwind	Winds SSE 4-10 km/hr sunny, 24°C
Commercial storage area; 80 m NW of eastern end of railway tracks	20-30 (A) downwind	winds near calm 29°C
Charles St.; 100 m south of source	70 (A) upwind	winds S 6 km/hr 28°C
Water Tower Inn; 2 km NE of source	30 (A) background	winds S 8 km/hr 29°C
August 20, 1986 Location	**Hg Conc. (ng/m^3)**	**Comments**
On site	10-500 ground 10 - 50 (A)	24°C
Lennox Ave.	20-30 (A) downwind	
John St.; 30 m from east property line	20-30 (A) upwind	ground level showed 20 ng/m^3
Water Tower Inn; 2 km NE of source	20 (A) background	

A.....Ambient, measured at height of 2-3 m.



Approx. scale: 1"= 100 ft

Figure 1. Mercury (Hg) concentrations, nanograms per metre cubed (ng/m^3).